AUTOMATIC DETECTION OF BIKERIDER WITHOUT HELMET

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ABSTRACT

Motorcycle accidents are growing throughout the years in all the countries, as there is a difference in social, economic and the transport conditions differ from place to place. Motorcycles are one of the prominent means of transport used by middle-class people. Wearing a helmet is one of the safety things of a bike rider, which might not be followed by all drivers. The accident of a motorcyclist is a serious issue. This project aims at prevention of accidents by automatically identifying the bike riders wearing helmets or not. For this, a Faster RCNN descriptor for features extraction is used. Based on Faster R-CNN feature Extraction, the real-time images captured by cameras are used. The best result got from classification was with an accuracy rate of 0.995, and the best result got from helmet detection is with an accuracy rate of 0.96.

INTRODUCTION

Two-wheelers are a top mode of transportation in almost every country. However, there is a high risk involved because of less protection. The bike riders should use helmets to lower the risk involved. Observing the importance of helmets, governments have made it a punishable offense to ride a bike without a helmet and have adopted manual strategies to catch the violators. However, the existing video surveillance-based methods are passive and require significant human help.

Such systems are infeasible because of the involvement of humans, whose efficiency decreases over a long duration. Automation of this process is most helpful for reliable and robust monitoring of these violations as well as it also significantly reduces the number of human resources required. Also, many countries are adopting systems involving surveillance cameras in public places. So, the solution for detecting violators using the existing infrastructure is also cost-effective.

Literature Survey

Romuere R. V. e Silva, Kelson R.T. Aires, Rodrigo de M. S. Vera's Detection of Helmet on Motorcyclists. In this paper, the process of classification and descriptors were used to detect the vehicles and then detect the persons with 2- wheelers and detect if they are wearing the helmet or not. The processes used in this project are:

Vehicle segmentation and classification

Detection of the background

A reference of the road as a background is considered so that they can detect the motion of the vehicle concerning the stable object (road).

Segmentation of moving objects-By using background subtraction, the moving objects (vehicles) are differentiated from the background, which gives only an image of the vehicles and the background image will be eliminated. Vehicle classification: The vehicles are classified as motorcycles or non-motorcycles and a feature vector is got for each generated image and passed on to a random forest classifier to categorize the vehicle like a motorcycle or a non-motorcycle.

The Determining of Roi: This step is carryout so that only the region of interest is chosen, which reduces the processing time and increases processing time.

The Extraction of the feature:

A sub-window is formed in the above generated Roi and the principal part of the image (head in this case) is extracted and passed as input for the classifier to check if the biker has put on his helmet or not. This project/paper does mainly deals with helmet detection. For it to be used in a surveillance system, it should be

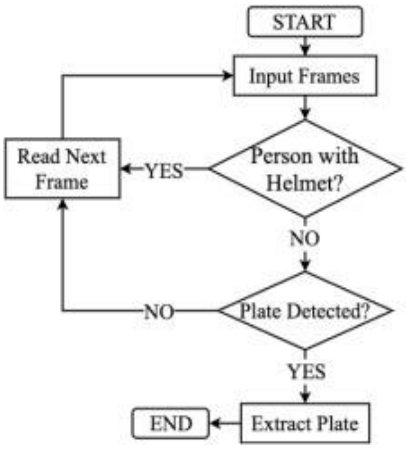
able to detect the number plate of the vehicle to impose fines on the rider which is lacking in this project.

Existing System

In the E- challan system, they installed CCTV cameras on the roads that record and track the footage of the continuous traffic all the time. If an individual is found guilty of not obeying any traffic regulation, then the traffic police will try to extract the number from the vehicle screen-shot captured from the footage of the offense from the respective CCTV and get the details of the defaulter with the license plate number from the VAHAN and SARATHI databases. As soon as they receive the details, an SMS will be sent on the registered phone number of the violator.

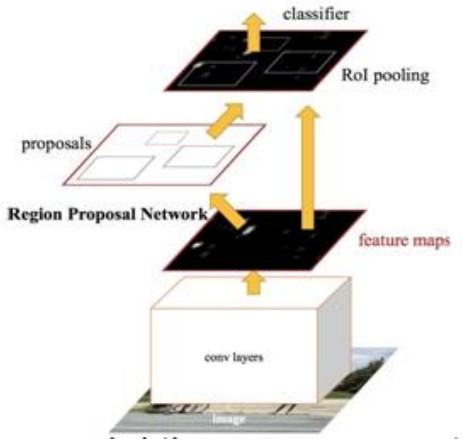
Proposed System

The system proposed by us involves automatic detection of biker rider driving without helmet and registration number of that vehicle is recognized. So it will be more efficient and will require less human intervention. The project aims to identify and detect a person riding a two-wheeler, a helmet, and a number plate using Tensor Flow. All these processes will perform with the help of OpenCV, Anaconda, Jupiter, Python, and many libraries.

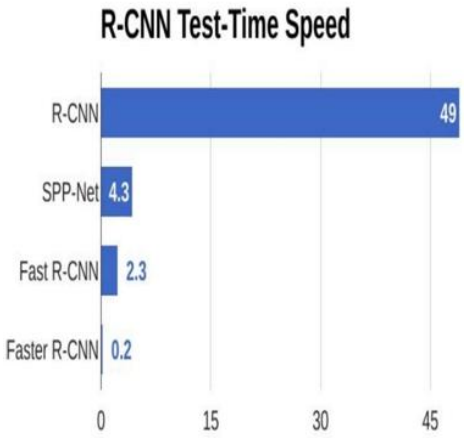


Faster R-CNN

Object detection is a computer technology related to computer vision and image processing that deals with detecting instances of semantic objects of a definite class (such as humans, buildings, or cars) in digital images and videos. Well researched domains of object detection include face detection and pedestrian detection. Object detection has applications in many areas of computer vision, including image retrieval and video surveillance. Something widely used is in computer vision tasks such as face detection, face recognition, video object co-segmentation. They also used it in tracking objects, for example. Tracking the ball during a football match, tracking the movement of a cricket bat, tracking a person in a video.



They provided the image as an input to a convolutional network, which provides a convolutional feature map. Instead of using a selective search algorithm on the feature map to identify the region proposals, a separate network is used to predict the region proposals. It then reshaped the forecast region proposals using a Roi pooling layer, which is after used to classify the image within the proposed region and predict the offset values for the bounding boxes.



From the above graph, you can see that Faster R-CNN is much faster than its predecessors. Therefore, we can use it for real-time object detection.

Results

Challenges

However, to adopt such automatic solutions, definite challenges need to be addressed:

Real-time Implementation: Processing a significant amount of information in a time constraint manner is a challenging task. Applications involve tasks like segmentation, feature extraction, classification, and tracking over a significant amount of data that needs to be processed in little time to achieve the goal of real-time implementation.

- **Occlusion:** In real-life scenarios, the dynamic objects usually occlude each other due to which object of interest may only be partially visible. Segmentation and classification become difficult for these partially visible objects.
- **The direction of Motion:** 3-dimensional objects, in general, have a different appearance from different angles. It is familiar that the accuracy of classifiers depends on a feature used, which one after the other depends on the angle to some extent. A fitting example is to consider the appearance of a bike rider from the front view and side view.
- **Temporal Changes in Conditions:** Over time, there are many changes in environmental conditions, such as illumination, shadows. There may be subtle or immediate changes that increase the complexity of tasks' background modeling.
- Quality of Video Feed: CCTV cameras capture low-resolution video. Also, conditions such as low light, poor weather complicate it further. Because of such limitations, tasks such as segmentation, classification, and tracking become even more difficult. As stated in, a successful framework for surveillance application should have convenient properties, such as real-time performance, fine-tuning, robustness to sudden changes, and predictive. Keeping these challenges and desired properties in mind, we propose a method for automatic detection of bike riders without helmets using feed from existing security cameras, which works in real-time.

Conclusion

This project aims to decrease the accidents caused due to not wearing the helmet. In this project, we are trying to create a model that could detect bike riders in images or video feeds. To differentiate the images between bike riders with helmet and without a helmet, the project is using the dataset which was annotated. It also stores the results of the image or frames of the violated people. The proposed system will also assist the traffic police for such violators in unusual environmental conditions like tropical sun, rain, etc. All the libraries and software used in our project are open-source. Therefore, it is very flexible and cost-efficient.

Future Enhancement:

In the future, we can use this model for the project in which we detect a bike rider without a helmet and

recognize the license plate of the bike so that an e-challan will generate.

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